MHF4U Name _____

Unit 4 Test – Characteristics of Functions
PRACTICE

Expectation	Level
D1 - demonstrate an understanding of average and instantaneous rate of change, and determine, numerically and graphically, and interpret the average rate of change of a function over a given interval and the instantaneous rate of change of a function at a given point;	

1. Find the average rate of change of $f(x)=7x^2-9x$ between $x=-4$ and $x=-2$
2. Find the instantaneous rate of change of $f(x)=7x^2-9x$ at $x=6$
3. A small town committee estimates that the population (P) of the town will change with respect to time, *t* in years according to the equation $N = 5000\ 1+\ t$. Estimate the *rate* at which the population will be increasing with respect to time at 3 years. Show all your calculations.
4. In general, does the speedometer of a car measure instantaneous rate of change (i.e., instantaneous speed) or average rate of change (i.e., average speed)? Describe situations in which the instantaneous speed and the average speed would be the same.

Expectation	Level
D2 - determine functions that result from the addition, subtraction, multiplication, and division of two functions and from the composition of two functions, describe some properties of the resulting functions, and solve related problems D3 - compare the characteristics of functions, and solve problems by modelling and reasoning with functions, including problems with solutions that are not accessible by standard algebraic techniques.	

1) Solve a) $2x = \sin x$ b) $2 - x = \sin x + 1$ c) $x = \cos x$

2. If $f(x) = x$ and $g(x) = 9x - 7$ and $h(x) = -2x^2 - 13$

a. Graph $g(f(h(x)))$ b. Graph $h(f(x))$

State the domain and range of each function.

3. Given that:

$f(x) = (3,4),(5,8),(1,9),(7,12),(-3,9)$

$g(x) = (3,7),(4,8),(7,9),(-7,12),(-3,0)$

Calculate $f(x)+g(x)$ $f(5)-g(7)$ $f(x)\bullet g(x)$ $f^{-1}(12)+g(-3)$